New Models in Collaborative R&D

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Technology Transfer From Government to Business: Entrepreneurial Perspective

- Innovation = Invention + Exploitation
  - Invention = Creative Process, Laboratory Discovery
  - Exploitation = Develop and Deliver Application of the Invention to One or More Users or Markets
- Innovation is a Slow Process
- Difficult to Innovate Consistently
- High Risk- High Reward: How Government Can Help Manage Risks

Business Risk Categories

- Technical Risk
- Market Risk
- Financial Risk
- Political Risk
- Personnel Risk

Patience Is a Necessary Virtue

- Innovation Process Can Be Very Slow
  - Internet invented 1969,
    - Mosaic Browser 1992
    - DotCom Business Boom late 1990s
  - Transistor Invented at Bell Labs 1949
    - First Commercial Product 1959
- Reasons for Slow Pace of Innovation
  - Cultural Conservatism: It's Not Broke, So Don't Fix It
  - My "Paradigm"is Just Fine Thank You
  - Cost vs. Benefit Is Not Apparent
  - Not Invented Here Syndrome

Charity Begins in the Lab?

- Inventing Lab May not Benefit Directly From Successful Innovation
  - ATT/Bell Labs (Transistor) → (Fairchild, National Intel, TI)
  - Xerox PARC (Ethernet, Mouse, GUI) → (3Com, Apple)
  - DARPA (Internet, Distributed Interactive Simulations) → DotComs, NetScape, Computer Games
  - Sandia Labs (Clean Room Technology)

Failure Is Always An Option!

- 90% of All Small Businesses Fail within First 5 Years (Remember the Dot.Bombs)
- MIT Study Found 90% of HighTech Businesses w/Technical Management Teams Failed
- BUT – 80% of HiTech Businesses w/Business Management Teams Succeeded
- Inventor May Not Benefit from Innovation

Winners and Losers in Technology Innovation

- **The Superior Technology Does Not Always Prevail in the Marketplace**
- Betamax vs. VHS
- MS Office vs. Lotus, WordPerfect, Harvard Graphics
- DOS/Windows vs. Apple OS, CPM, OS2, Linux, Unix,
- Amiga, Macintosh vs. IBM PC

Critical Success Factors for G2B Collaborative Innovation

- Staffing
- Metrics
- Financing

Key Players on a Successful Entrepreneurial Technology Venture

- Idea Generator: Technical Lead, Scientist, Creative Thinker
- Product Champion: Entrepreneur, Idea-Exploiter
- Program Manager: Business Support and Coordination
- Resource Sponsor: Financier, Coach

Program Metrics
Government vs. Business

- Government Metrics
- **Process and Programmatic**
- No. Agreements Signed
- No. VC Investments made
- Total VC dollars invested
- $ From Tech Licenses
- No. R&D projects w/Industry
- **Political and Economic**
- No. New Jobs Created
- No. $ Invested Locally
- No Embarrassments
- **Technical**
- Benefit to Agency From New Products
- Advance in State of the Art

- Business Metrics
  - Revenue
  - Profit
  - Market Share
  - Growth Rate
  - Time to Market
  - Return on Investment
  - Liquidity for Investors

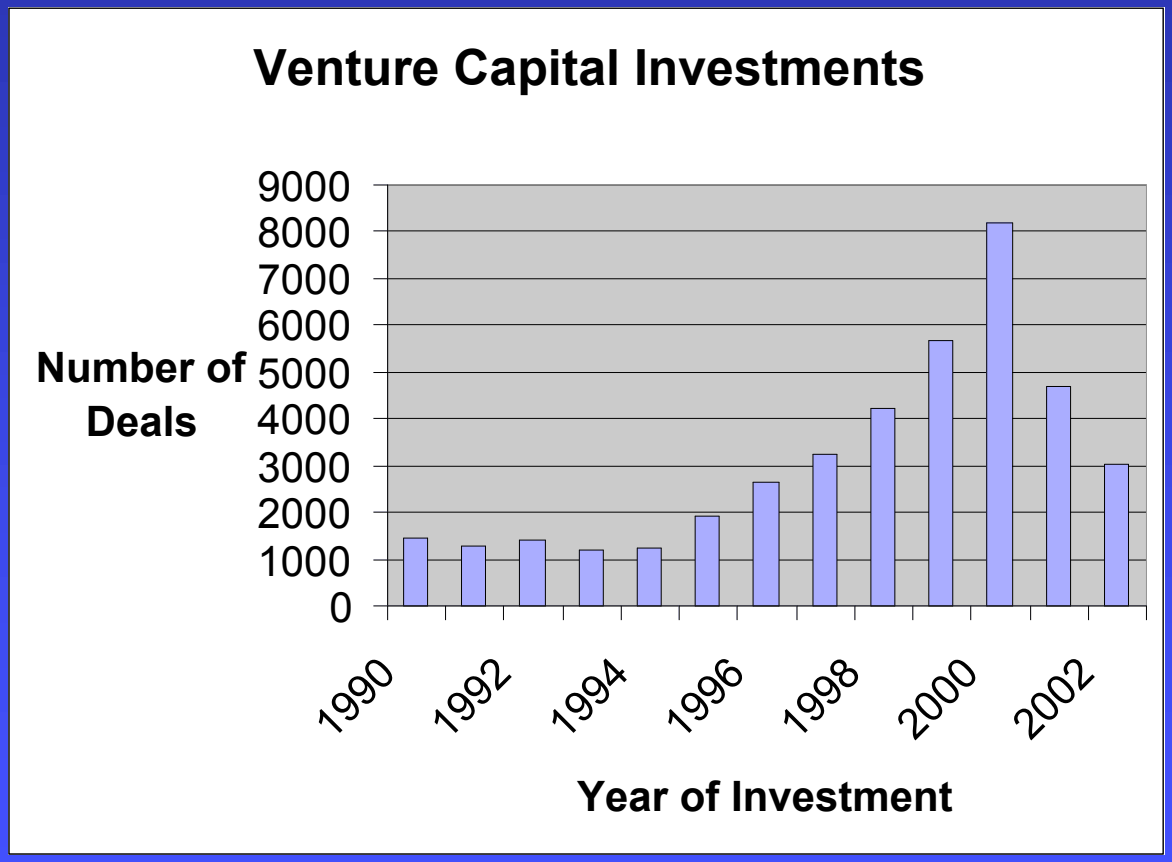
Financing Innovation in Stages

- Financial Lifecycle Stages
- Requirements Usually Grow over Time
  - Seed or Startup: Product Development, Market Research
  - First and Second Stage: Begin Product Roll-out, Full Scale Operations,
  - Third Stage – Major expansion, new products
  - Mezzanine, IPO
- Sources of Money
  - Personal Assets
  - Friends and Family
  - Angel Investors
  - Venture Capital Funds
  - Banks
  - Strategic Partners
  - Public Markets (IPO)
  - Contracts, Grants, SBIRs
- Introduction to Money
  - Investment Bankers
  - Accountants and Lawyers
  - Venture Forums

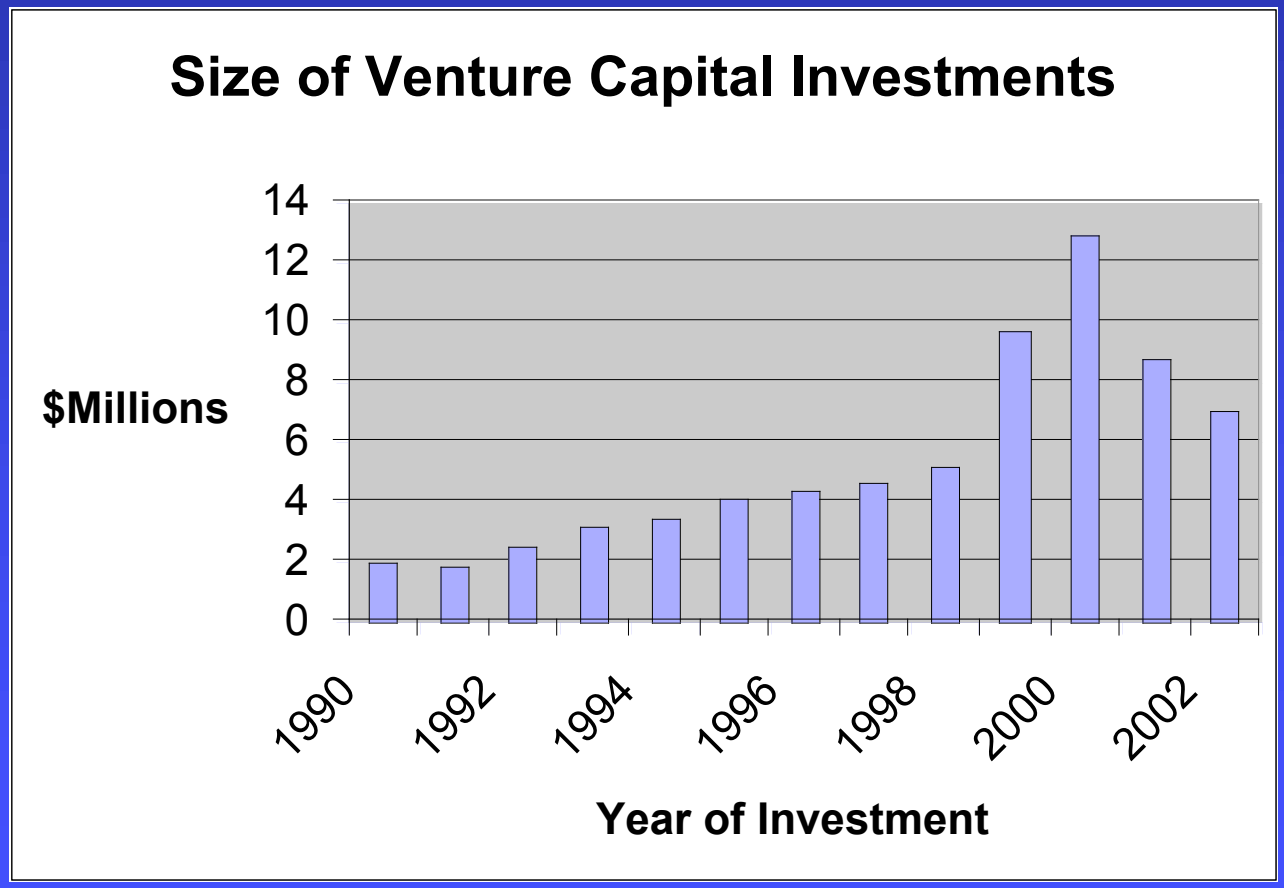
Welcome to Venture Capital

- What is a Venture Capital Fund?
- Where Do they Get their Money?
- How Much/How Little Will VCs Invest
- What do VCs Look For in an Investment?
- How Do VCs Make Money?
  - Rule of Thirds

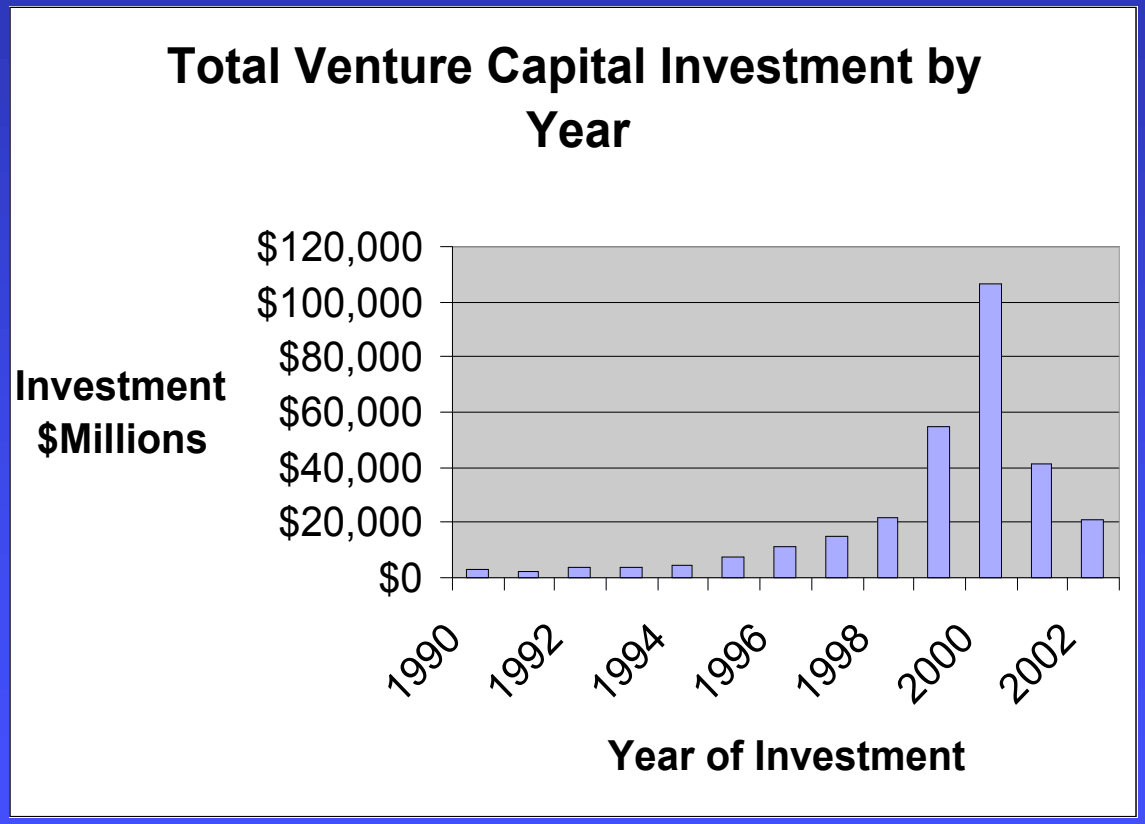
Recent Trends In Venture Capital Investments



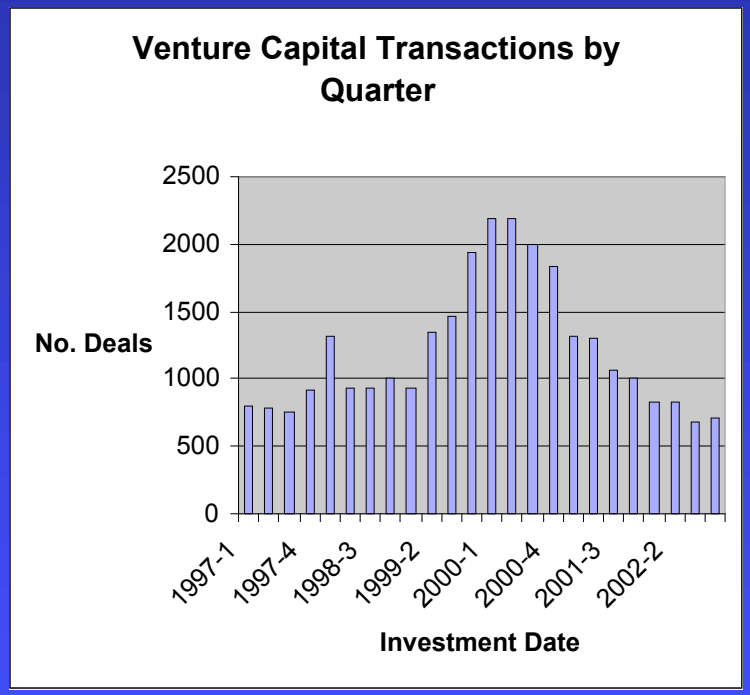
Recent Trends In Size of Venture Capital Investment

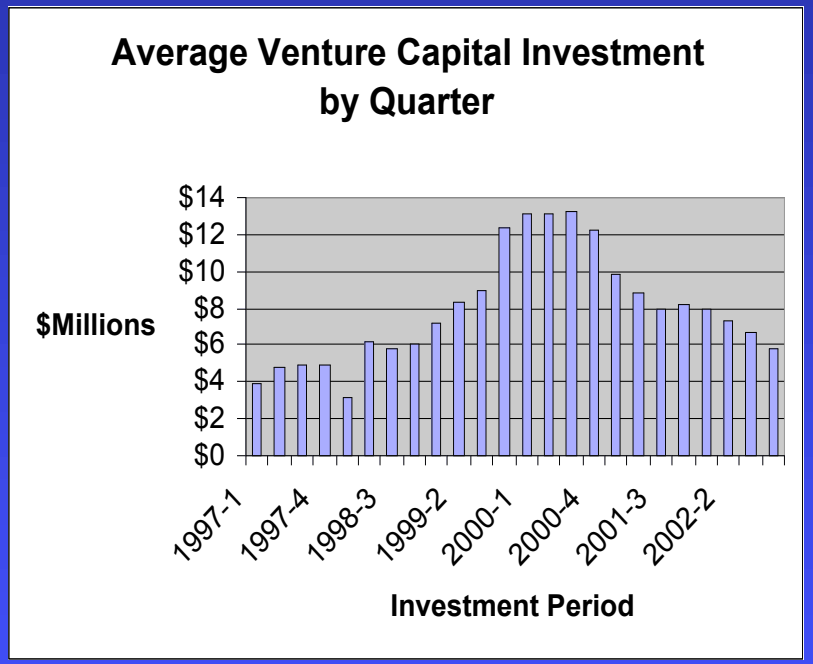


Total Annual Venture Capital Investments



Venture Capital Trends Over the Last 5 Years by Quarter





What Does Venture Capital Cost?

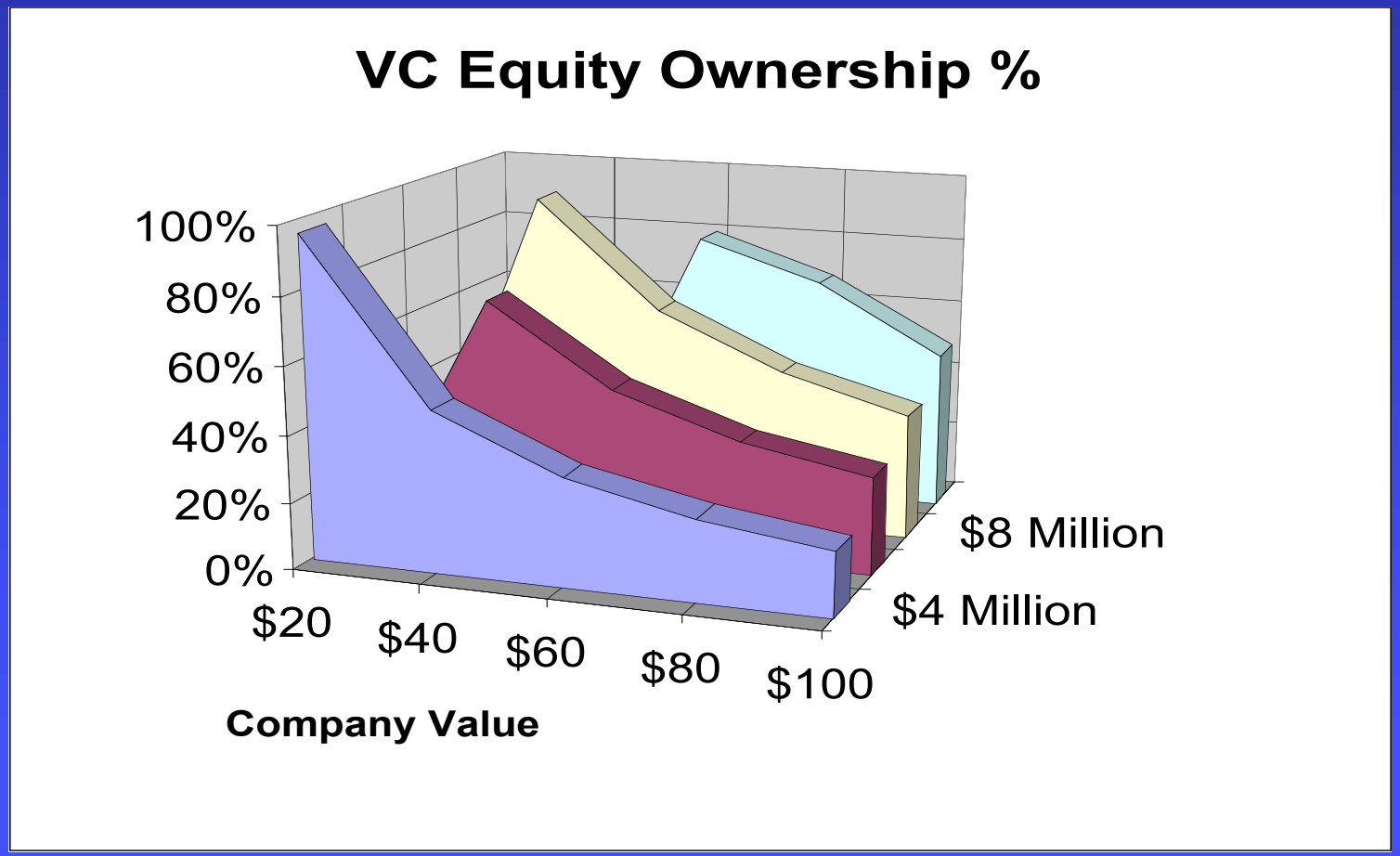
Seed or Startup Stage: 50-60% ROI – 10 times investment in five years

First & Second Stage: 30-50% ROI - 5 to 7 times investment in five years

Third Stage & Mezzanine: 20-30% ROI

Percentage Ownership of a Company that a VC Requires to Make 30% Annual Annual Return On Investment Based On Estimated Market Value of the Company After 6 Years						
Co.Value ($M)		$20	$40	$60	$80	$100
Investment ($M)	4	96%	48%	32%	24%	19%
	6	N/A	72%	48%	36%	29%
	8	N/A	96%	64%	48%	38%

VC Equity Ownership Demand



Venture Capital in Aerospace

- Very Few Sources
- Mature Market
- Slow Growth Rates
- Large Investments Required
- Long Time to Market
- Large Number of Failed Ventures
- Absence of Pool of Happy Investors

Different Approaches to Collaborative R&D

- NASA/State of MS Joint Venture: MSCI
- NASA SBIRs
- NAVY – Center for Commercialization of Advanced Technology (CCAT)
- Department of Energy Labs –Outsourcing (Battelle, Lockheed Martin)
- CIA - In-Q-Tel [Quasi Venture Capital]
- Army – Applied Communication and Information Networking (ACIN) [Defense Incubator]
- GPS

Observations on SBIRs

- Advantages
  - No equity dilution
  - Retain IP ownership
  - Customer focused
  - Follow-on potential in phase 2, phase 3
  - Leverage of private capital encouraged (DOD Fast Track)
- Disadvantages
  - Topics Selected by Govt.
  - Multiple Program Objectives
  - Limited Phase 1, 2 Funding
  - Lengthy decision cycle
  - Low Probability of Award
  - Complex Application Process
  - Fixed Schedule of Procurements
  - Slow Payment

Think Orthogonally!

- Do not confuse the source lab with the end market
- Good technology can be applied anywhere
  - Cryogenic quenching → turbine blades vs. cutlery
  - Microwave amplifier tubes → Radar vs. Kitchen appliance
  - Rocket motor technology → consumer ceramics/BBQ, electronic packages, GNC > automated security tracking systems

Recommendations for Government Programs

- Embrace Risk, Help to Mitigate Technical, Financial, Personnel
- Make Decisions Faster
- Seek Out and Work With Entrepreneurs, Business Schools, Investor Groups, Venture Forums, Business Plan Competitions